

## AMENDMENTS TO THE CLAIMS

Claim 1 (Currently Amended): A method of non catalytic organic synthesis in a Cannizzaro reaction, or Beckmann rearrangement reaction that proceeds using  $\text{OH}^-$ , which comprises performing said reaction ~~in the absence of catalyst without addition of any basic catalyst~~ in supercritical water or subcritical water of at least 350 °C with a reaction time of 10-400 seconds, utilizing a supply of  $\text{OH}^-$  from said water.

Claim 2 (Currently Amended): A method of increasing a reaction rate of an organic synthesis in a Cannizzaro reaction, or Beckmann rearrangement reaction that proceeds using  $\text{OH}^-$ , which comprises performing the organic synthesis reaction ~~in the absence of catalyst without addition of any basic catalyst~~ in supercritical water or subcritical water of at least 350°C with a reaction time of 10-400 seconds, utilizing a supply of  $\text{OH}^-$  from said water.

Claim 3 (Currently Amended): The method according to Claim 1, wherein alcohol and carboxylic acid are generated by performing a Cannizzaro reaction ~~in the absence of catalyst without addition of basic catalyst~~ in supercritical water or subcritical water of at least 350°C.

Claim 4 (Currently Amended): The method according to Claim 2, wherein alcohol and carboxylic acid are generated by performing a Cannizzaro reaction ~~in the absence of catalyst without addition of any basic catalyst~~ in supercritical water or subcritical water of at least 350°C at a reaction time of 10-400 seconds, utilizing a supply of  $\text{OH}^-$  from said water.

Claim 5 (Currently Amended): The method according to Claim 3, wherein alcohol and carboxylic acid are generated from an aldehyde ~~in the absence of catalyst without addition of the basic catalyst~~ near the critical point of the supercritical water.

Claim 6 (Currently Amended): The method according to Claim 4, wherein alcohol and carboxylic acid are generated from an aldehyde ~~in the absence of catalyst without addition of the basic catalyst~~ near the critical point of the supercritical water.

Claim 7 (Previously Presented): The method as claimed in Claim 1, wherein said reaction is performed in water at 375 to 380 °C and 22.5-25 MPa.

Claim 8 (Previously Presented): The method as claimed in Claim 2, wherein said reaction is performed in water at 375 to 380 °C and 22.5-25 MPa.

Claim 9 (Previously Presented): The method as claimed in Claim 3, wherein said reaction is performed in water at 375 to 380 °C and 22.5-25 MPa.

Claim 10 (Previously Presented): The method as claimed in Claim 4, wherein said reaction is performed in water at 375 to 380 °C and 22.5-25 MPa.

Claim 11 (Previously Presented): The method as claimed in Claim 1, wherein said reaction is performed in supercritical water.

Claim 12 (Previously Presented): The method as claimed in Claim 1, wherein said reaction is performed in subcritical water of at least 350°C.

Claim 13 (Previously Presented): The method as claimed in Claim 2, wherein said reaction is performed in supercritical water.

Claim 14 (Previously Presented): The method as claimed in Claim 2, wherein said reaction is performed in subcritical water of at least 350°C.

Claim 15 (Currently Amended): The method as claimed in ~~Claim 1~~, Claim 3, wherein said reaction is performed in supercritical water.

Claim 16 (Currently Amended): The method as claimed in ~~Claim 1~~, Claim 3 wherein said reaction is performed in subcritical water of at least 350°C.

Claim 17 (Previously Presented): The method as claimed in Claim 4, wherein said reaction is performed in supercritical water.

Claim 18 (Previously Presented): The method as claimed in Claim 4, wherein said reaction is performed in subcritical water of at least 350°C.

Claim 19 (Previously Presented): The method according to Claim 5, wherein the alcohol is benzyl alcohol, the carboxylic acid is benzoic acid, and the aldehyde is benzaldehyde.

Claim 20 (Previously Presented): The method according to Claim 6, wherein the alcohol is benzyl alcohol, the carboxylic acid is benzoic acid, and the aldehyde is benzaldehyde.

Claim 21 (New): The method as claimed in Claim 1, wherein said reaction is performed in water at a pressure of at least 22.05 MPa.

Claim 22 (New): The method as claimed in Claim 2, wherein said reaction is performed in water at a pressure of at least 22.05 MPa.

### SUPPORT FOR THE AMENDMENTS

This Amendment amends Claims 1-6 and 15-16; and adds new Claims 21-22.

Support for the amendments is found in the specification and claims as originally filed. In particular, support for Claims 21-22 is found in the specification at least at page 11, lines 12-13. No new matter would be introduced by entry of these amendments.

Upon entry of these amendments, Claims 1-22 will be pending in this application. Claims 1 and 2 are independent.

### REQUEST FOR RECONSIDERATION

Applicants respectfully request entry of the foregoing and reexamination and reconsideration of the application, as amended, in light of the remarks that follow.

Applicants thank the Examiner for the courtesies extended to their representative during the personal interview on December 16, 2003. Applicants thank the Examiner for the indication at the interview that at least Claims 7-10 are allowable. See Interview Summary dated December 16, 2003. However, for the reasons discussed below, Applicants respectfully submit that all of pending Claims 1-22 are allowable.

Applicants have discovered that organic Cannizzaro and Beckmann rearrangement reactions that proceed using  $\text{OH}^-$  occur rapidly, with reaction times of 10-400 seconds, in water in the absence of any basic catalyst if the water is supercritical, or subcritical at a temperature of at least 350 °C.

Claims 1-20 are rejected under 35 U.S.C. § 103(a) over J. Org. Chem. 1997, 62, 2505-2511 ("An").

An discloses applications of high-temperature aqueous media for synthetic organic reactions and notes in Table 1 **thirty-six different "Example Reactions and Conditions"**. Entry No. 36 in An's Table 1 is a Cannizzaro reaction performed at 290°C for 60 minutes (= 3600 seconds) in a 0.1 M NaOH medium. Nowhere else does An discuss Entry No. 36.

An discloses in Entry No. 11 a reaction performed for 10 minutes (= 600 seconds). However, the reaction in Entry No. 11 is not the recited "Cannizzaro reaction, or Beckman rearrangement reaction".

An discloses in Entry Nos. 25-26 reactions involving the addition of water to alkenes and dehydration of alcohols, and notes that such reactions can be facilitated under pressures up to 50 atmospheres. An at page 5209, column 2, line 28 to page 2510, column 1, line 16. However, the reactions in Entry Nos. 25-26 are not the recited "Cannizzaro reaction, or a Beckman rearrangement reaction".

An fails to suggest the combination of features of independent Claims 1 and 2 of a "Cannizzaro reaction, or a Beckman rearrangement reaction" carried out "in supercritical water or subcritical water of at least 350°C with a reaction time of 10-400 seconds, utilizing a supply of OH<sup>-</sup> from said water".

There is no reasonable expectation that An would lead the skilled artisan to the claimed invention. An makes the following general introductory remarks:

The past decade has seen increasing use of water as a medium for nonenzymatic organic reactions. Synthetic procedures developed by several groups have been employed temperatures at and below boiling. On the other hand, conditions near **supercritical (T<sub>c</sub> water = 374 °C)** have been investigated mainly for production of liquid and gaseous fuels from biomass, for geochemical modeling, and for the destruction of waste and hazardous materials. Jointly, the group of Katritzky and Siskin conducted extensive studies and found that super-heated water not only was an effective solvent for organic reactions but also could react.

With temperature rise from ambient toward the critical point, the dielectric constant of water decreases substantially, yet the ionic product increases by 3 orders of magnitude. The properties appear anomalous, the former implying a decrease in polarity with temperature rise, and the latter, an increase due to higher dissociation. **This behavior suggests that the role of**

**water may be complex** and could vary with the temperature of organic reactions in aqueous media. To support this interpretation, we have observed that for some reactions optimal conditions prevail over a narrow range of time and temperature, yet for others, sets of optima are possible. An at 2505, column 1, line 4 to page 2506, column 1, line 3 (emphasis added).

Because An indicates that the role of water in high-temperature synthetic organic reactions may be complex, there is no reasonable expectation that the skilled artisan would have been successfully led from An's isolated disclosures that (i) water is supercritical at  $T_c = 374\text{ }^\circ\text{C}$ ; (ii) the reaction time for the reaction (neither Cannizzaro nor Beckman rearrangement) of Entry No. 11 is 10 minutes (= 600 seconds); and (iii) the reaction conditions for the Cannizzaro reaction of Entry No. 36 are  $290\text{ }^\circ\text{C}$  and 60 minutes (= 3600 seconds), to the limitations of independent Claims 1 and 2 of a "Cannizzaro reaction, or a Beckman rearrangement reaction" carried out "in supercritical water or subcritical water of at least  $350^\circ\text{C}$  with a reaction time of 10-400 seconds, utilizing a supply of  $\text{OH}^-$  from said water".

Because An fails to suggest all the limitations of the claimed invention, and there is no reasonable expectation of success, the rejection under 35 U.S.C. § 103(a) over An should be withdrawn.

Claims 3-6 are rejected under 35 U.S.C. § 112, first paragraph. The Office Action asserts that

[T]he specification, while being enabling for benzaldehyde for an aldehyde, benzyl alcohol for an alcohol, and benzoic acid for an a carboxylic acid does not reasonably provide enablement for all the aldehydes, the alcohols, and the carboxylic acids. Office Action at page 3, lines 1-4.

Applicants respectfully traverse the rejection. The "Cannizzaro reaction" limitation of independent Claims 1-2 limits the aldehydes of Claims 3-6 to only those aldehydes with no  $\alpha$ -hydrogen. See, e.g., the description of the Cannizzaro reaction in Organic Chemistry, 3d edition, page 663, copy attached. Because the specification enables the skilled artisan to

practice the invention of Claims 3-6 without undue experimentation, the rejection under 35 U.S.C. § 112, first paragraph, should be withdrawn.

In view of the foregoing amendments and remarks, Applicants respectfully submit that the application is in condition for allowance. Applicants respectfully request favorable consideration and prompt allowance of the application.

Should the Examiner believe that anything further is necessary in order to place the application in even better condition for allowance, the Examiner is invited to contact Applicants' undersigned attorney at the telephone number listed below.

Respectfully submitted,

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Attachment:

Organic Chemistry, 3d edition, page 6<sup>3</sup>~~63~~

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